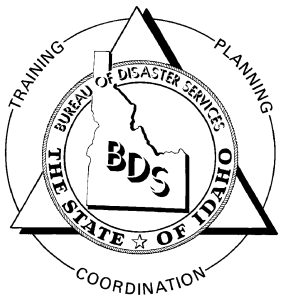

INTERAGENCY RISK ASSESSMENT FOR THE BOISE FRONT

October 22, 1996

Prepared by the Idaho Bureau of Disaster Services
for Ada County and Boise City

REASON FOR THE REPORT

Following the Eighth Street Fire, government agencies responsible for watershed recovery and public-safety mitigation prepared an Interagency Fire Rehabilitation Report, "Eighth Street Fire" dated September 12, 1996. The report was prepared in a very short time, so that there was a concern about the credibility of some of the flow estimates. The risk analysis, based on a worst-case scenario, seemed too extensive to sell to the public and officials who could effect funding for mitigation and response mechanisms. And finally, local decision-makers needed some way to measure the impact of proposed rehabilitation and remediation actions.

PROCESS

The Bureau of Disaster Services (BDS) requested participation of a number of agencies and subsequently facilitated a meeting of creditable members of the scientific community to review the threat and identify flow projections before and after various protective measures have been implemented. The projections were to be based on actual protective measures in place as well as proposed. Given the lack of time for extensive studies, this required a consensus opinion of scientists with the experience and expertise to make such evaluations.

In response to BDS's request, a team met October 16 and 17, consisting of representatives from Bureau of Land Management, Boise National Forest, Department of Fish and Game, Department of Lands, Department of Water Resources, Idaho Geological Survey, Natural Resource Conservation Service, US Geological Survey, Army Corps of Engineers, National Weather Service, City of Boise, and Boise State University.

RESOLUTION

While personal and professional opinions were diverse and sometimes divergent, the team provided a consensus on the three problem issues.

Peak stream flows for Cottonwood Creek. Extrapolated peak stream flows for Cottonwood Creek, provided in Table III-2 of the report, are probably too large. The model used for this extrapolation is more appropriate for clear-water flows, and the height of the flow was probably misinterpreted by using the height of the wall of debris that leads the water, which is higher than the water itself.

Values for peak flows are estimates only and are not intended for design of any facility. Facilities such as dams would require a more extensive analysis, but the results of such analysis would be expected to be of a similar order of magnitude.

Even though many Boiseans perceive flows out of Cottonwood canyon to belong entirely to Cottonwood Creek, the drainages of concern to this study are Freestone and Upper Freestone Creeks, which join Cottonwood Creek just before it flow out into the valley. The subtraction of the Cottonwood Creek drainage would also reduce the expected peak flows.

Risk analysis. The initial goal if the Bureau of Disaster Services was to refocus on water flows and debris flows for three rainfall events, but there is no additional data beyond what was used for the report, so that it is useless to attempt to characterize rainfall events in any greater detail.

A lack of information about the performance of burned watersheds like those above Boise means that scientists can offer only opinions based on their own experience. This is supplied in the report's Table III-1 (with the deletion of Cottonwood Creek as discussed above). Characterizing the composition of the debris is also speculative. Small boulders have been noted from the 1959 event, and, while boulders and cobblestones would likely be present, the bulk of the debris would probably be sand-and-silt slurry that would have a greater impact on structures beyond the canyons, since larger debris could be expected to lose their energy as the flow spreads out after it comes out of the canyon mouth.

A triggering rainfall event would be sufficient to create debris flows large enough to cause damage and is the event that the current rehabilitation seeks to mitigate. This triggering event is a rainstorm averaging 0.4" to 0.6" in an hour, which is based on historical precipitation records, has a 50% chance of occurrence in a given year. There are other equivalent events: sudden melting of the snowpack, shorter high-intensity thunderstorms, for instance, that could result in the same runoffs.

Measuring the impact of rehabilitation actions. Rather than wrestling with various models of risk, an expression of exposure to damaging events was devised (Figure 1). The vertical axis represents the potential for damaging events given the triggering rainfall event, and the horizontal axis represents time after the burn. Line A traces this exposure over the five years that it takes for the drainage to return to its pre-fire condition. Immediately after the fire, therefore, the potential is greatest, and this level remains for about a year, when vegetation begins to return. But vegetation alone does not prevent runoff. Root systems, vegetative debris, and soil condition, all essential for retaining water and slowing its runoff, have been compromised. Experience in other similarly burned areas shows that the exposure remains high for four years as the ecosystem restores itself to the pre-fire condition when the drainage is capable of accommodating the triggering event without causing damage downstream.

Current rehabilitation actions include five lines of defense that treat the entire drainage, from the top to the bottom, both public and private lands. These treatments include contour trenching, contour felled logs or wattles, tilling, straw-bale check dams, gravel bags, road drainage improvements, and seeding. Proposed activities are the construction of debris basins and dams.

The effect of current rehabilitation is shown in Line B. By controlling flows, the potential for damaging events is reduced to about one-half as soon as it is complete. Exposure remains at this reduced level until the watershed is completely restored.

Most of the current rehabilitation actions are aimed at controlling the flows resulting from the triggering event, but some (the contour trenching) has a goal of controlling the larger runoffs. Should the runoffs be considerably larger than produced by the triggering event, some of the current rehabilitation would be overtopped and could be expected to fail in providing protection against exposure. The trenching, for instance, which is designed for a much larger event, would remain and provide a reduced exposure, but at a higher level. This is shown by Line C.

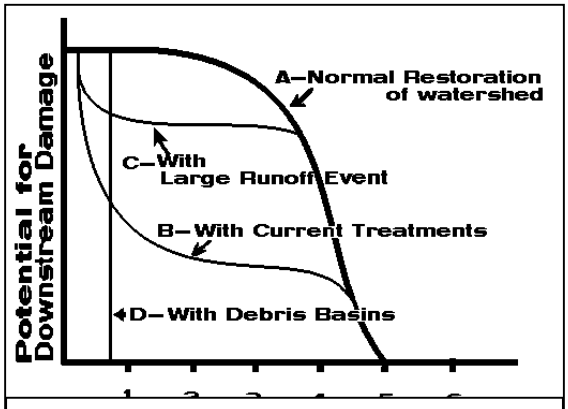

Figure 1: Exposure to Damage from Triggering Precipitation Event

The effect of debris basins is shown by Line D. Exposure is reduced to pre-fire levels immediately

on completion. This does not mean the debris basins should be constructed in preference to other treatments. If the watershed is not rehabilitated, the resulting large flows could overwhelm the basins and exacerbate damage downstream by picking up the sediments.

CONFIDENCE

Given the lack of published information on the response of burned watersheds, the lack of professional evaluation of previous events in the foothills, and the general lack of knowledge about precipitation patterns in the foothills, the comfort level of the team members with their conclusions was not uniformly high. Quantities of water, quantities of debris and its composition, and the measure of precipitation of the triggering event were at times hotly debated. While issues were not resolved, the results of the workshop represent a consensus of the team.

CONSTRUCTIVE DATA SOURCES

The following were identified as critical to a better understanding of fire and watershed mechanisms in the Boise foothills:

- The history of fires and debris flows to include geomorphologic mapping of past events
- Collection and locating in a suitable repository of unpublished reports from various agencies regarding watershed behavior, soils behavior, and flows
- Evaluation of watershed treatment programs
- Quantitative mapping of sediments
- Development of a model for predicting flows within inhabited areas
- Evaluation of land-use policies and practices
- Instrumentation to develop a rainfall and runoff model
- Ongoing evaluation of the condition of the watersheds
- Evaluation of the effects of prescribed burns and grazing policies
- Hazard maps

These items should be included in any plans or programs for mitigation or studies that could be funded from available sources.

PARTICIPANTS

Bob Bishop	Natural Resources Conservation Service
Mary Donato	U.S. Geological Survey
Patrick Frischumuth	Idaho Bureau of Disaster Services
Virginia Gillerman	Idaho Geological Survey
Clayton Hanson	U.S. Department of Agriculture
Jerry Jones	Boise Public Works
Richard Kelsey	EnvironSearch
Steve Lipscomb	U.S. Geological Survey
Cavan Maloney	Us. Forest Service
Mary Mellema	National Weather Service
Chuck Mickelson	Boise City
Robert Morris	Natural Resources Conservation Service
Garth Newton	Morrison Knudsen
Bill Ondrechen	Idaho Department of Water Resources
John Priester	Ada County
Lotwick Reese	Idaho Transportation Department
Davis Reese	Corps of Engineers
Bruce Schofield	Bureau of Land Management
John Thornton	Boise National Forest
Stephen Weiser	Bureau of Disaster Services
Spencer Wood	Boise State University
Jim Wyllie	Boise Public Works